Fall parade

The annual Child Care Center Fall Carnival Costume Parade snaked through JSC on Oct. 28, bringing an adorable assortment of superheroes, princesses, witches and goblins to the center. JSC team members lined up outside their buildings to pass out goodies to the trick-or-treaters.


NASA JSC2005E42729


NASA JSC2005E42780


NASA JSC2005E42737


NASA JSC2005E42771


NASA JSC2005E42775

Photography: Crystal Schroeder

Space Center Roundup

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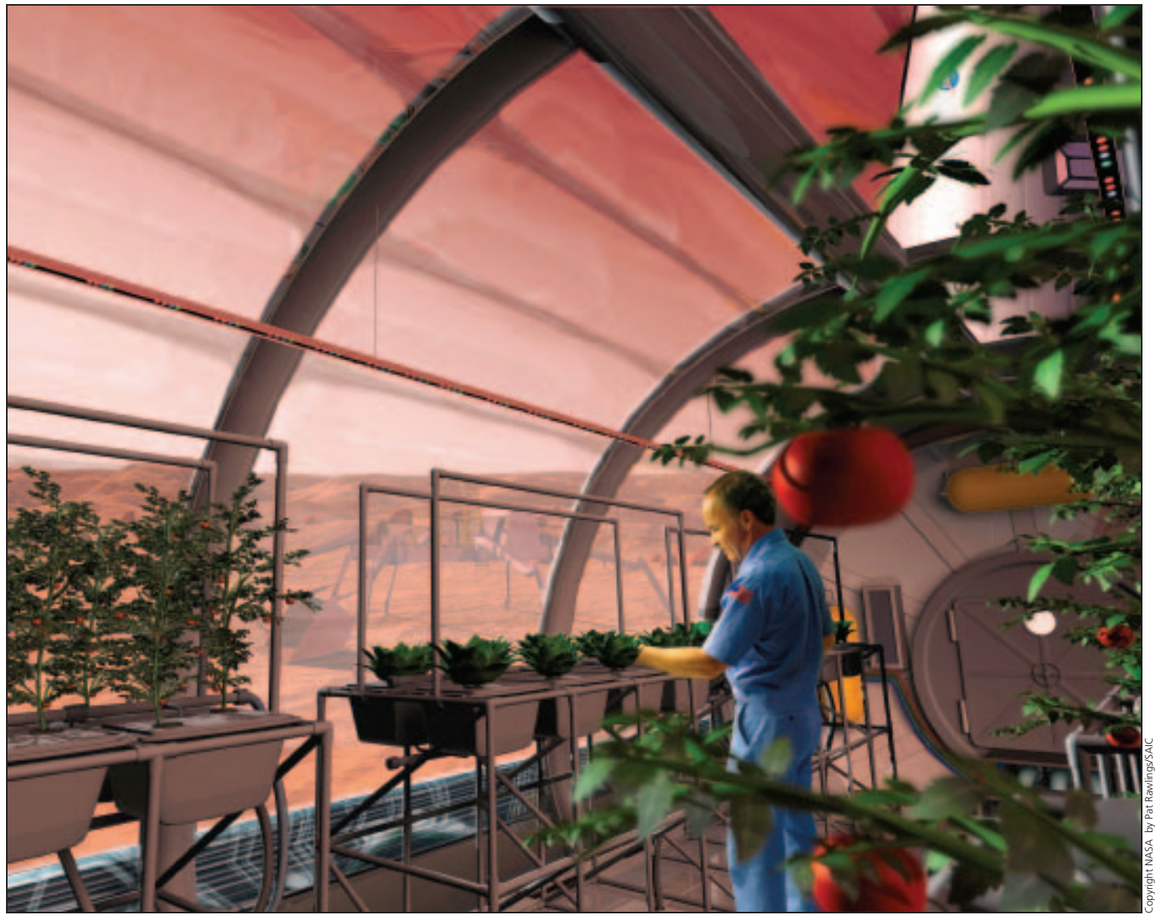
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Out-of-this-world food

Space food scientists at Johnson Space Center project that fruit and vegetable crops grown during future missions to the moon and Mars will be cultivated in hydroponic growth chambers similar to this conceptual image. Hydroponic growth chambers enable scientists to grow plants in a water-based system that delivers food and water to the roots of the plants while eliminating the need for soil.

December
2005
Houston, Texas

From the Center Director

A MESSAGE FROM CENTER DIRECTOR MICHAEL L. COATS

Rick Emerie

Family matters

It seems appropriate, especially at this time of year, that my first Roundup column be about one of my top priorities, and that is families. The nature of our space business is such that we attract talented, dedicated and hard-working people. They take a great deal of pride in the jobs they do, and they do them well. There are times we all have to work long hours, sometimes for extended periods of time, and frequent travel away from home is part of the job. But it's imperative that families come first.

I've learned over the years that taking good care of the family at home makes you much more productive at work. And while there are times when we all put in the extra time and effort when we should, there is enough flexibility built into the rules to allow everyone to invest the necessary time in our family life.

I certainly enjoyed my shuttle missions, but my fondest memories are of coaching my daughter's soccer and softball teams, my son's Little League and Pony League teams, and attending their high school baseball games and marching band performances. I even miss sitting in hard bleacher seats.

After more than 37 years in the aviation and space business, I know I'll never have to tell someone they aren't working hard enough, but many times I've had to tell folks late at night to go home to the family. I encourage everyone to stop for a few minutes and think about their priorities. And remember that you are part of your family, too, and taking care of yourself is critical. You owe it to yourself and your family to make the effort to be around for a long while.

I know I don't have to explain the benefits of proper diet and exercise, and I haven't always been the best example, but your health has to be your first priority. Personal time is also important. Part of a healthy lifestyle is to find the time on a regular basis to do what you enjoy doing. The pace of life is becoming more frantic all the time. If you don't believe me, just try driving at the speed limit sometime. Make sure you slow down occasionally and enjoy the riches and beauty of the wonderful world around us.

Lastly, I'd like to point out that you are part of the "Space Family" as well. It doesn't matter to me whether you're a government or contractor employee; we are all part of a team that needs to function as smoothly as possible in order to accomplish the missions of operating the shuttle and station safely while at the same time transitioning to a new space transportation system. Good communications are mandatory, and treating each other with respect, consideration and patience will not only help us achieve our mission objectives but continue to make the Johnson Space Center the best place in or out of this world to work. I am realizing one of my dreams, which is to work for all of you here at JSC, and I'm looking forward to a busy and productive year in 2006. Please enjoy the holiday season, and spend some time with your proudest achievements – your families.

Michael L. Coats

NASA names former astronaut new Johnson Space Center director

NASA S86-33163

Coats is a retired Navy captain who graduated from the Naval Academy in 1968. He flew 315 combat missions in southeast Asia from 1970-1972 as an A-7E pilot aboard the USS Kittyhawk. He later served as a test pilot and flight instructor at the Naval Test Pilot School.

Selected as an astronaut candidate in January 1978, Coats became a NASA astronaut in August 1979. A veteran of three spaceflights, Coats has logged over 463 hours in space.

NASA S78-35297

Michael L. Coats has been named director of Johnson Space Center. Coats is a former astronaut, and recently served as vice president of Lockheed Martin Astronautics in Denver. He is the ninth person to serve as director in the center's 44-year history.

"Mike Coats brings a perfect blend of experience to his new role as the head of the nation's primary center for human spaceflight development and operations," said NASA Administrator Michael Griffin. "As a former pilot and astronaut, and a long-time aerospace industry executive, he knows what our next generation of manned spacecraft must be able to do, and he knows what it takes to produce them. I'm delighted to welcome Mike back home to NASA."

Coats joined NASA in 1978 as a member of the first astronaut class specifically selected to fly the space shuttle. He flew three shuttle missions, the first as pilot for the maiden flight of *Discovery* in 1984. He commanded two subsequent shuttle missions, logging a total of more than 463 hours in space.

Before joining NASA he was a distinguished U.S. Navy aviator. He logged more than 5,000 hours of flight time in 28 different types of aircraft. He retired from NASA and the Navy in August 1991.

"I look forward to returning to JSC, and I am honored by the trust Mike Griffin has shown in me," Coats said. "We will embrace the challenge of the new Constellation program that will take us first to the moon, and then on to Mars. At the same time, the contributions of the space shuttle and International Space Station will be critical steps in that journey, and we remain committed to their success."

Coats replaces Jefferson D. Howell Jr., who is on assignment as a visiting professor to the Lyndon B. Johnson School of Public Affairs at the University of Texas at Austin.

Beyond 'the good Earth'

by Brad Thomas

Holiday observances from space have varied in scope, but the first caused people around the world to turn their attention to the heavens when the Apollo 8 crew delivered its famous Christmas Eve broadcast from lunar orbit.

Commander Frank Borman, Command Module Pilot Jim Lovell and Lunar Module Pilot William Anders became the first humans to orbit the moon on Christmas Eve 1968. They were also the first astronauts to spend Christmas in space.

During the live broadcast, they sent Christmas greetings and images back to their home planet. The mission provided stunning images of the moon and of the Earth, including the famous image of the Earth rising above the lunar surface. Lovell said, "The vast loneliness is awe-inspiring, and it makes you realize just what you have back there on Earth."

Near the end of the broadcast, the Apollo 8 crew read from the Bible in the Book of Genesis. Before the Scripture reading, Borman closed the message with the words "good night, good luck, a Merry Christmas, and God bless all of you – all of you on the good Earth."

It is estimated that as many as 1 billion people watched the historic broadcast or listened to it on the radio.

Apollo 8 launched from Earth on Dec. 21, 1968 and entered lunar orbit on Christmas Eve. The Apollo 8 crewmembers ended their history-making journey when they splashed down in the Pacific Ocean on Dec. 27. Eight more Apollo missions would visit the moon, with six of them landing on its surface.

The Skylab 4 crew was the next set of astronauts to spend Christmas in space, in 1973. To give Skylab a touch of the holiday season, Commander Gerald Carr, Pilot William Pogue and Scientist Edward Gibson made a Christmas tree with food cans.

It would be 22 years before another American would spend Christmas outside Earth's atmosphere. Astronaut John Blaha celebrated the holiday in orbit aboard the Russian Mir space station in 1996.

NASA ISS01E11145

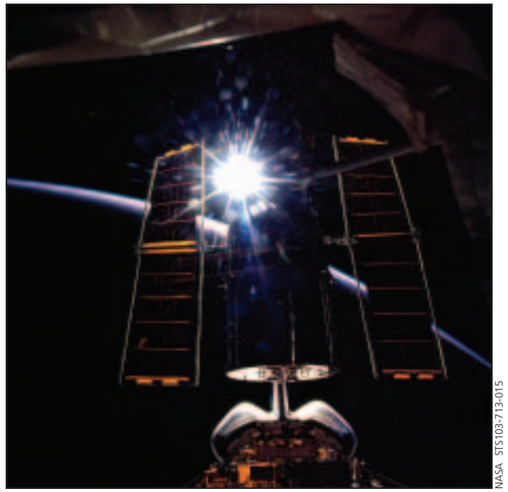
Astronaut Leroy Chiao, Expedition 10 commander and ISS science officer, poses with holiday decorations in the Destiny laboratory of the International Space Station.

In 1999, the STS-103 crew gave NASA and the world a present that is still giving to the scientific community. After three consecutive days of spacewalks to make repairs and upgrades, they returned the Hubble Space Telescope to service on Christmas Day. Hubble had been in hibernation since the loss of its fourth gyroscope, which was designed to enable the telescope to point precisely at distant astronomical targets for scientific observations.

After waking to Bing Crosby's "I'll be Home for Christmas," STS-103 Commander Curt Brown began the busy Christmas Day in orbit with a special holiday greeting. "Merry Christmas to all of you down there," Brown said. "And Hubble will be home for Christmas 'cause today we're going to set her free."

Later, each of the seven STS-103 crewmembers, including astronauts from the United States, France and Switzerland, called down holiday wishes from space in several languages after Space Shuttle *Discovery* departed Hubble.

The first Christmas aboard the space station occurred in 2000 with the Expedition 1 crew. Astronaut Bill Shepherd and cosmonauts Yuri Gidzenko and Sergei Krikalev spent a quiet Christmas Day opening gifts and talking to their families.



NASA STS103-713-015

The sun reflects off the Hubble Space Telescope above the space shuttle Discovery's cargo bay in Earth orbit. It was returned to service by the STS-103 crew on Christmas Day, 1999.

Even though Santa and his reindeer are unable to reach the orbital outpost, the station crews still receive gifts. The holiday treats are sent to the station on space shuttle, Soyuz and Progress spacecraft.

Four more crews have spent Christmas on the space station. Expedition 4 celebrated with turkey and other traditional holiday foods. The Expedition 6 crew assembled and frosted a cake shaped like a candy cane.

The Expedition 8 crewmembers – Commander Mike Foale and Flight Engineer Alexander Kaleri – celebrated their second Christmas in space with a relaxing day off. Foale served as an STS-103 crewmember and Kaleri served aboard Mir with Blaha. But before winding down for their time off, the duo provided a video of holiday preparations.

In 2004, Christmas Day was unique for Mission Control and for the crew aboard the station. As parts of Houston experienced their first-ever white Christmas, flight controllers tracked the progress of a special delivery to the station. Late in the day, the Expedition 10 crew welcomed the arrival of a Progress cargo ship carrying supplies.

The station's current crewmembers, Expedition 12 Commander Bill McArthur and Flight Engineer Valery Tokarev, expect to receive holiday goodies aboard a Progress cargo ship scheduled to arrive at the station Dec. 23.

When the clock strikes midnight...

on Jan. 1, it signifies the end of one year and the beginning of another. Officially, the same is true on the International Space Station. However, a station crew could make the case for celebrating New Year's more than once in a 24-hour period.

The station crew's official time-keeping system is Coordinated Universal Time (UTC), which is often referred to as Greenwich Mean Time. Central Standard Time, which is the time used by Houstonians, is six hours behind UTC. For example, when the new year arrives on the station at 0000 UTC (12 a.m.) Jan. 1, it will be 6 p.m. CST Dec. 31 in Houston.

Due to the station's orbit, the crew will unofficially see the arrival of the new year multiple times. The space station orbits the Earth 16 times per day; therefore, it crosses the International Date Line 16 times.

Station crews usually enjoy well-deserved off-duty time and talking with their families on New Year's Day.

The Expedition 1 crew, the first to live aboard the station, marked the beginning of 2001 with a special log entry. Commander Bill Shepherd followed a U.S. Navy tradition in which the person in charge on a ship provides an entry at the start of a new year. He entered a poem that he penned.

NASA ISS008E10768

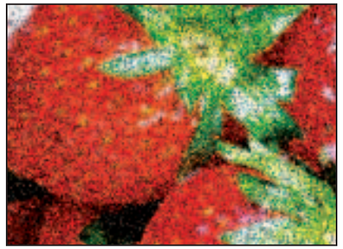
Astronaut C. Michael Foale (left), Expedition 8 mission commander and ISS science officer, and cosmonaut Alexander Y. Kaleri, flight engineer, pose with holiday decorations in the Zvezda Service Module on the space station.

Cosmic cuisine of the future

THE ADVANCED FOOD SYSTEM

by Tiffany Travis





How do you feed a crew of six astronauts on an 80-million-mile, three-year mission to Mars, where there are no grocery stores, gardens, farms, fertile soil or a resupply vehicle?

Dr. Michele Perchonok, advanced food systems lead at Johnson Space Center, is one of the many space food scientists working harder than ever to find the answer to this question. Perchonok is developing an Advanced Food System (AFS) that will provide crews traveling to the moon and Mars with safe, nutritious and appetizing food while minimizing volume, mass and waste.

Perchonok said one of the most exciting outcomes of the research and development of an AFS is the potential advancement in food technology.

"There are so many emerging technologies that will be available for use by the time we go on extended missions to the moon or Mars," Perchonok said. "These technologies, whether new preservation technologies or improved methods to process the crops, will allow us to have an even more acceptable and nutritious food system."

Shelf life and packaging

One of the biggest challenges facing Perchonok and her team of space food scientists is the development of the packaging materials needed for the AFS.

"Our biggest challenge in the near future is to develop a packaging material that provides us with high oxygen and moisture barrier properties without the foil layer (now being used in food packaging). In addition, this packaging material must be compatible with our current preservation technologies," Perchonok said.

"If we are successful, the result will be less packaging waste and easier waste disposal through biodegradation or by incineration," she said.

The AFS approach includes extending the shelf life of a stored food system from 18 months (currently the typical shelf life of space station stored foods) to up to five years, while maintaining a variety of great-tasting foods. With the need for longer shelf life, the menu will move more towards thermostabilized foods, which maintain their quality longer than current freeze-dried foods.

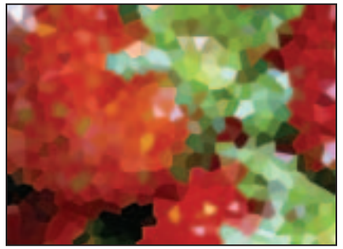
The food will be contained in airtight, lightweight packaging toensure freshness. It will then be stored in the crew vehicle to maximize its shelf life while remaining accessible to the crew.

Space gardening

In addition to stored foods, the AFS includes a menu of fresh vegetables. Ten pick-and-eat vegetable crops have been identified for possible growth in transit on long-duration missions: lettuce, spinach, carrots, tomatoes, green onions, radishes, bell peppers, strawberries, fresh herbs and cabbages.

These crops will provide the crew with added nutrition and variety. Veggies, unlike prepackaged foods, will add bright colors, crisp textures and fresh aromas to the crew's menu.

A typical martian dinner might include dishes such as spinach and tomato crouton salad, wheat pasta...



When the crewmembers arrive at their destination, the lack of fertile soil on the lunar and martian surfaces will make stepping into the backyard to grow a garden impossible. Instead, astronauts will build hydroponic growth labs, where pick-and-eat vegetables – as well as white and sweet potatoes, soybeans, wheat, rice, peanuts and dried beans – can be grown. The latter crops would require processing to convert raw goods, such as wheat, into foods such as bread and pasta.

To make food processing a reality, specialized equipment will likely be needed for each crop grown. The martian food processing equipment will be much smaller than standardized equipment and will use minimal water, power and crew time.

If harvested crops cannot be grown, bulk ingredients such as packaged soybeans or wheat berries can be sent with the crew on the mission to be used later.

What's cooking in the kitchen?

Once on the moon or martian surface, each of the crew's meals will be prepared in the habitat galley using fresh vegetables, ingredients processed from the crops and other stored items. The galley equipment will likely be similar to commercially available gourmet kitchen appliances, modified for use in partial gravity.

A typical martian dinner might include dishes such as spinach and tomato crouton salad, wheat pasta with tomato sauce and a chocolate peanut butter soymilk shake.

Martian dining for the body and mind

The crew's health and well-being will be a high priority throughout the mission. The longer the mission, the more important it is to have a quality food system that is nutritious, safe and tasty.

In addition to the crew's physical health, psychosocial health has been identified as an important factor during space missions. There is a concern that if crewmembers are under stress, their health and performance will suffer.

Anecdotal reports state that healthier and tastier foods will decrease the stress often experienced by the crew. This suggests that taste, menu variety and an array of textures, colors and flavors can contribute to the psychosocial well-being of the crew.

Next steps

In the near term, researchers of the AFS must determine the galley requirements for the Crew Exploration Vehicle and develop the new and improved packaging material that will integrate with current preservation technologies.

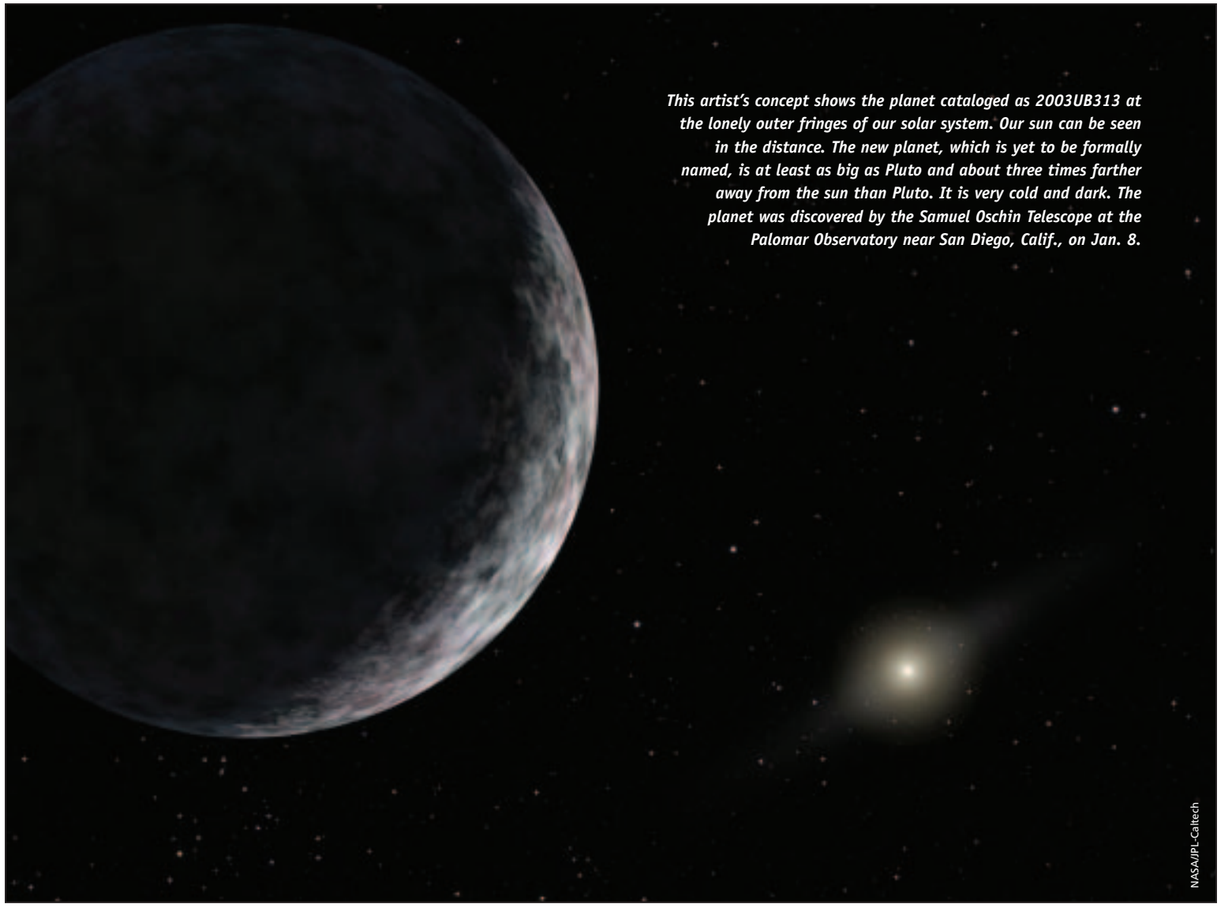
In the long term, scientists will determine which preservation methods and packaging materials will provide a five-year shelf life for the stored food system. Then experts will need to develop enough products to provide the crew with enough variety and nutrition for the three-year mission to Mars.

Perchonok and her team at JSC are also keeping several extreme long-term goals in mind.

"We will also be developing food preparation and food processing equipment for the Mars missions that is really long term since the Mars missions – where crops are grown and food is processed – are over 30 years away!" Perchonok said.

Stealing Pluto's thunder

by Catherine E. Borsché



This artist's concept shows the planet cataloged as 2003UB313 at the lonely outer fringes of our solar system. Our sun can be seen in the distance. The new planet, which is yet to be formally named, is at least as big as Pluto and about three times farther away from the sun than Pluto. It is very cold and dark. The planet was discovered by the Samuel Oschin Telescope at the Palomar Observatory near San Diego, Calif., on Jan. 8.

NASA/JPL-Caltech

It looks as if the schoolteachers may be redoing their solar system charts.

A new planet has been discovered in the solar system. And, if you were to craft this planet out of foam for a school science project, it would be roughly 20 to 30 percent larger than Pluto.

On July 29, 2005, Dr. Mike Brown of the California Institute of Technology (Caltech) announced the discovery of the new planet in the outer region of our solar system. The planet, which hasn't been officially named yet, is about 97 times farther from the sun than Earth, or 97 Astronomical Units (AU). In comparison, Pluto is 30 AU from the sun.

This places the new planet in the Kuiper Belt, a dark realm beyond Neptune where thousands of small icy bodies orbit the sun. The planet appears to be typical of Kuiper Belt objects, only much bigger. Its sheer size in relation to the nine known planets means that it can only be classified as a planet, Brown said.

Backyard astronomers with modern detectors mounted on large telescopes can find the new planet, which looks like a dim speck of light moving very slowly against the starry background.

The planet was discovered by Brown, Chad Trujillo of the Gemini Observatory in Mauna Kea, Hawaii, and David Rabinowitz of Yale University in New Haven, Conn. They first photographed the new planet with Caltech's 48-inch Samuel Oschin Telescope on Oct. 31, 2003. The object was so far away, however, that its motion was not detected until they reanalyzed the data in January of this year.

"We are 100 percent confident that this is the first object bigger than Pluto ever found in the outer solar system," Brown said.

The planet's temporary name is 2003 UB313. A permanent name has been proposed by the discoverers to the International Astronomical Union (IAU), and they are awaiting a decision before announcing the name. However, scientists have nicknamed the planet Xena after the fictional warrior princess.

And, to add even more wonder to the discovery itself, this planet has company out in the recesses of the solar system.

"Since the day we discovered Xena, the big question has been whether or not it has a moon," Brown said. "Having a moon is just inherently cool – and it is something that most self-respecting planets have, so it is good to see that this one does too."

Brown estimates that the moon, dubbed Gabrielle after Xena's sidekick, is at least one-tenth the size of Xena.

"Pluto once seemed a unique oddball at the fringe of the solar system," Brown said. "But we now see that Xena, Pluto and the others are part of a diverse family of large objects with similar characteristics, histories and even moons, which together will teach us more about the solar system than any single oddball ever would."

To be or not to be...a planet

Not everyone in the astronomy community agrees with Xena's, or for that matter Pluto's, planetary distinction.

"There's been a big debate going on for some time, even before the tenth planet Xena was discovered," Dr. Ed Barker, planetary astronomer in the Astromaterials Research and Exploration Science (ARES) Directorate at JSC, said. "I'm really on the side that it's not a planet."

The debate heated up as astronomers learned more about our solar system and found that Mercury, Venus, Mars, Jupiter, Saturn, Uranus and Neptune were not alone. Scientists began discovering objects that did not fit neatly into the planet category, but were still significant nonetheless. It became clear these objects were not planets, but "little planetoids," Dr. Mark Matney, JSC ARES planetary scientist, said.

As a result of these findings, a separate "minor planets" category was designated. Ten years ago, there were about 28,000 minor planets, also known as asteroids. Now close to 300,000 have been discovered.

> "Having a moon is just inherently cool – and it is something that most self-respecting planets have..."

"It's clear that Jupiter, Saturn, Uranus and Neptune are a family, the gas giants. But Pluto we've known for a long time is different from the others. Then, with the discovery of Kuiper Belt objects, people began talking about Pluto maybe being a big Kuiper Belt object," Matney said. "And here you find an object [Xena] that's clearly bigger than Pluto..."

To complicate matters, Xena has a moon. "And that's where the parallels really are. In fact, there are two or three other Kuiper Belt objects that have moons also," Barker said.

So, is Xena just really a Kuiper Belt object with a moon – or a planet?

Unfortunately, it's more in the eye of the beholder than anything else. The IAU has not officially ruled on whether or not Xena is a planet, or even how they plan on defining a planet in general.

There are probably more cultural reasons to classify Xena as a planet than anything else. If Pluto stays categorized as a planet because it has long been considered one, then Xena too must be a planet. Xena clearly has more heft than Pluto, and has a moon to boot.

"Whatever happens to Pluto, it sounds like Xena will be in the same category," Matney said.

One thing is for sure. "There's just a lot of leftover building blocks out in the outer solar system," Barker said.

Which means, as Matney said, "There may be some more Xenas before we're done."

A new day

NASA/Blair ISC2005E42285

NASA/Blair ISC2005E42285

Pictured left to right:
Rep. Ken Calvert (R-CA), Rep. Sheila Jackson Lee (D-TX), and Rep. Al Green (D-TX), during a visit to Johnson Space Center and Mission Control on Oct. 24, talk with Expedition 12 Commander Bill McArthur (above right) and Flight Engineer Valery Tokarev aboard the International Space Station.

a new mission

X12

by Catherine E. Borsché

On Sept. 30, humankind again reached for the stars with the launch of the Expedition 12 crew. Onboard the trip to the orbiting complex were Expedition 12 Commander William McArthur, Expedition 12 Flight Engineer Valery Tokarev and spaceflight participant Gregory Olsen.

Although station operations and maintenance will take up most of the time for the Expedition 12 crew, research, science-focused educational activities and Earth observations will continue to be priorities.

"In its very broadest sense, our goals are first to maintain the operational state of the International Space Station, to conduct research that is targeted toward enhancing our capability to live and work in space," McArthur said. "We would like to see expansion of this unique laboratory environment so that future crews will have an even more capable space station to work in."

The operation of individual experiments on Expedition 12 is expected to total several thousand hours, adding to the more than 100,000 hours of experiment operation time already accumulated aboard the station.

One such experiment "gives us the opportunity to grow some plants on the space station to be ready to go for long-duration flights to the other planets," Tokarev said. "For example, there is an experiment called Plants. That experiment allows [us] to obtain peas grown on the station in the fourth and fifth generation, and we'll be able to also grow greens that we will be able to consume as food."

The ability to grow and harvest food in space is of considerable importance, as it will be necessary for long-duration flight and our ultimate survival.

"In any case, we are now living in a world with limited resources," Tokarev said. "People who don't look ahead and don't think about the future don't live in the future."

On Nov. 7, the crewmembers participated in their first spacewalk together. This excursion was the first station-based spacewalk in United States suits in more than two years. This spacewalk was also a first for Tokarev.

Camera installation on the Port 1 Truss was the first primary task. The new device is similar to the camera assembly on the Starboard 1 Truss. This camera will play a big role in future station assembly, as it will be used after the arrival of the Port 3 and Port 4 Truss segments during STS-115.

McArthur and Tokarev spent about two hours, 10 minutes on the camera assembly installation. In order to have daylight for the Floating Potential Probe jettison, they moved on to one of the get-ahead tasks: the retrieval of a failed remote joint motor controller. Engineers said they were anxious to get this one back to see what went wrong before others are sent to the space station.

The crew then removed and jettisoned the Floating Potential Probe, which is designed to measure the station's electrical potential and compare it to the surrounding plasma.

Crewmembers then completed a second get-ahead task: removal and replacement of a remote power controller module, a kind of circuit breaker. This is on the mobile transporter, which moves along railroad-like tracks on the station's main truss.

This won't be the last time the crew ventures outside. An additional spacewalk is slated for December. There may even be a third spacewalk in early 2006 originating from the Quest Airlock, but that is still being discussed.

Expedition 12 will have ample opportunities to make its mark toward the Vision for Space Exploration during the crew's six-month stay. There are still many unknowns that need to be solved before we can venture to the moon, Mars and beyond.

"Well, to steal a few words from Mark Twain … He wrote that, in 20 years, you'll be more disappointed by the things you didn't do than by the things you did do," McArthur said. "I think space exploration has been this tremendous catalyst for the development of technology in this country, and in the world. It's been a tremendous catalyst for us to make the human condition better."

McArthur offers another viewpoint on where space exploration needs to be.

"I think we cheat a little bit right now. We launch from Earth, we spend a long time on orbit, and we go back to Earth where we have this cadre of wonderful people there to scoop us up and keep us warm and safe," McArthur said. "It's almost like we're the child that's peeked out of the womb, gotten a little bit scared, and we've gone back in where it's nice and safe and comfortable. Well, we need to give birth to true interplanetary space exploration. And, I would say the space station is going to allow us to do that."